SHOUT
SHARE
IT

Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices

UNITED STATES DEPARTMENT OF AGRICULTURE

BULLETIN No. 406

Contribution from the Bureau of Plant Industry
WM. A. TAYLOR, Chief

Washington, D. C. PROFESSIONAL PAPER September 5, 1916

DISTINGUISHING CHARACTERS OF THE SEEDS OF SUDAN GRASS AND JOHNSON GRASS.

By F. H. Hillman, *Assistant Botanist, Seed Laboratory.*

CONTENTS.

	Page.		Page.
Introduction	1	Distinguishing characters of the seeds of Johnson grass	4
Distinguishing characters of the seeds of Sudan grass	3	Apparent exceptions to the distinguishing characters described	4

INTRODUCTION.

The close relationship of Sudan grass and Johnson grass leads to a pronounced similarity in their seeds. The two kinds of seed can be distinguished, however, when their comparative size and certain features of their appearance due to differences in development are considered. Oakley [1] and Vinall [2] have referred to these characters as useful in distinguishing these two kinds of seeds.

When properly interpreted, the distinguishing characters are believed to be sufficiently reliable to make possible an accurate quantitative analysis of a mixture of the two kinds of seed, even though unhulled grains of both grasses are present.

When the seeds of the two kinds are under observation, the larger size of the Sudan grass seeds, including the hulled grains, is readily noticeable. The lighter color of the hulled grains is also evident.

Distinguishing characters presented by either of the two kinds of seed observable in the absence of the other depend chiefly on a difference in the development of the plants preparatory to seed fall. This may best be understood by first considering the structure of the terminal clusters of the general seed cluster, or inflorescence taken collectively. One of these seed clusters, shown in figure 2, illustrating

[1] Oakley, R. A. Some new grasses for the South. U. S. Dept. Agr. Yearbook, 1912, p. 495–504, pl. 65–70. 1913.

[2] Vinall, H. N. U. S. Dept. Agr., Farmers' Bul. 605, p. 15. 1914.

Johnson grass, is seen to bear several seeds (ripened spikelets) attached directly (sessile) at the nodes of the jointed axis (rachis) of the cluster. These are indicated in figure 2 by *a*, which shows them as occurring along only one side of the axis. Accompanying these fertile or grain-bearing spikelets, which constitute the greater part of the unhulled commercial seed, are several slender, sterile spikelets (*b*), each elevated on a stem or pedicel (*d*) which is attached with a fertile spikelet at a node of the rachis. It is to be noted that the terminal fertile spikelet is accompanied by two sterile spikelets with their pedicels. It is especially to be noted that in the figure each node and the apex of each pedicel are marked by a distinct cross line indicating the suture (*e*) at the articulation or junction of each rachis segment and of each pedicel with its spikelet.

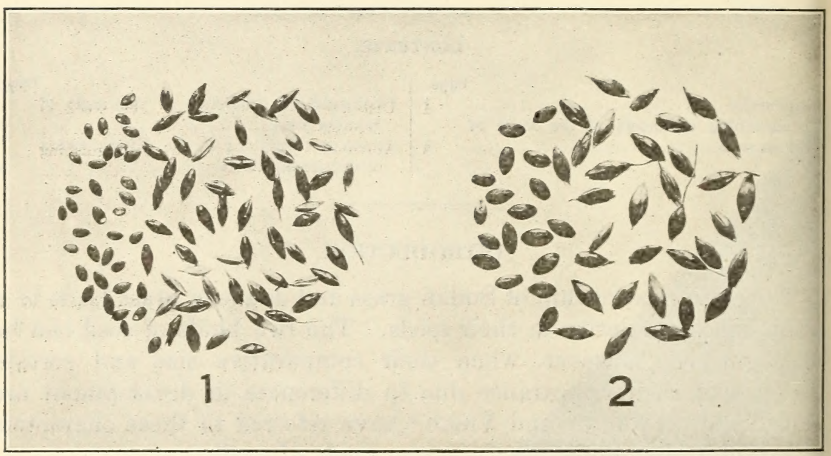

FIG. 1.—Seeds of Johnson grass (1) and Sudan grass (2). Hulled grains appear at the left of each group. (Natural size, from a photograph.)

It is the normal habit of the seed clusters of Johnson grass at maturity to break apart at these sutures, thus providing for the fall of the seed. Each rachis segment and accompanying pedicel remain attached to a mature spikelet or unhulled seed. Terminal spikelets retain the two pedicels. The rachis segment and pedicel or the two pedicels may be referred to collectively as the appendages of the seed.

In Sudan grass the terminal seed clusters in general structure are essentially the same as in Johnson grass. They differ, however, in being devoid of a suture at the nodes of the rachis and apex of the pedicels. In consequence, the seed fall does not uniformly result from separation at the articulation, but rather from the breaking of the rachis segments and pedicels at their weakest point, usually near the center (fig. 3, *c*). Most of the unhulled seeds therefore have a short stem (fig. 3, *a*).

What appear to be exceptions to the general rule of seed fall occur in both kinds of seed, but the presence or absence of the distinguishing suture is evident under a good magnifier.

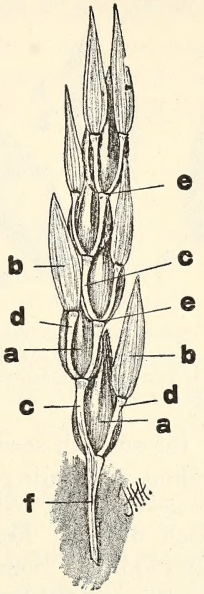

FIG. 2.—Seed cluster of Johnson grass, enlarged: *a*, *a*, Fertile spikelets; *b*, *b*, sterile spikelets; *c*, *c*, axis, or rachis, of the cluster; *d*, *d*, pedicels of sterile flowers; *e*, *e*, sutures at the articulation of spikelets with the axis; *f*, branch of the inflorescence bearing the seed cluster.

DISTINGUISHING CHARACTERS OF THE SEEDS OF SUDAN GRASS.

Sudan grass seeds in the hull (fig. 3, *1*) vary from eighteen one-hundredths to twenty-five one-hundredths of an inch in length, exclusive of the short stem. Most of the seeds bear at the base of each a short stem (fig. 3, *a*), which is jaggedly broken at its extremity. This stem represents the upper portion of a rachis segment and is expanded at its articulation with the spikelet, or seed. The articulation may be marked by a slight constriction (fig. 3, *b*), but it has no distinct suture. The appendages of the spikelet usually are jaggedly broken and not expanded at the apex (fig. 3, *c*). The missing portion corresponds to the short stem of the spikelet described.

The seed hull is mainly straw colored or light tawny. Many seeds are tinged or spotted with brown. Some are tinged or spotted with red. The darkest are blackish brown. In general, commercial seed has a smaller proportion of reddish and blackish brown seeds than Johnson grass.

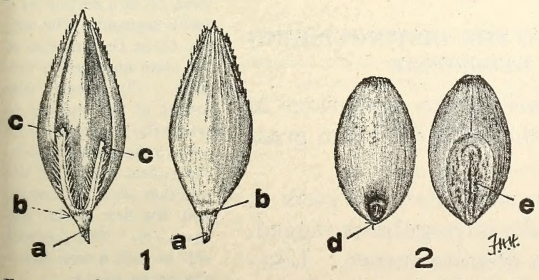

FIG. 3.—Sudan grass seeds, enlarged. Unhulled seeds, spikelets (1); hulled grains (2): *a*, *a*, Seed stem; *b*, *b*, constriction at the junction of seed and stem; *c*, *c*, appendages of the seed with broken apexes; *d*, scar of the grain; *e*, embryo.

The hulled grains (fig. 3, *2*) vary from thirteen one-hundredths to eighteen one-hundredths of an inch in length and are light reddish brown. They are larger, more commonly elliptical in outline, and lighter colored than in Johnson grass. Even in the smaller grains the embryo is relatively larger than that found in Johnson grass seeds.

DISTINGUISHING CHARACTERS OF THE SEEDS OF JOHNSON GRASS.

Johnson grass seeds in the hull (fig. 4, *1*) vary in length from fifteen one-hundredths to twenty-two one-hundredths of an inch. Most of the seeds have a smooth, rounded, and light-colored scar at the base. The appendages of the seed (fig. 4, *b*) are mostly entire, expanded, cup shaped, and smooth at the apexes, corresponding with the scar at the base of the seed. The uniformly smooth border of the expanded, cup-shaped apex, together with the smooth seed scar, results from the normal separation of the seed along a definite suture.

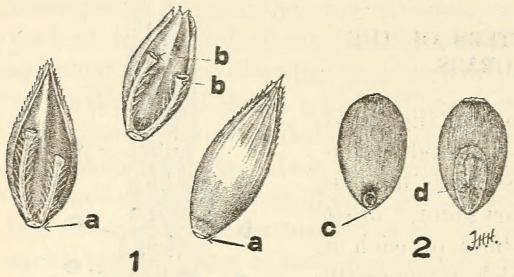

FIG. 4.—Johnson grass seeds, enlarged. Unhulled seeds, spikelets (1); hulled grains (2): *a*, *a*, Scar of the hull; *b*, *b*, appendages of the seed with expanded, cup-shaped apexes; *c*, scar of the grain; *d*, embryo.

The prevailing color of mature seed hulls is blackish brown. Many seeds are partially or wholly reddish. Some are straw colored. A few are tawny or light brown.

The hulled grains (fig. 4, *2*) vary from eight one-hundredths to twelve one-hundredths of an inch in length. They usually are oval, sometimes oval-elliptical in outline, the embryo end tending to be the more pointed. The color is dark reddish brown. They are noticeably smaller and darker colored than those of Sudan grass and have a relatively narrower embryo (fig. 4, *d*).

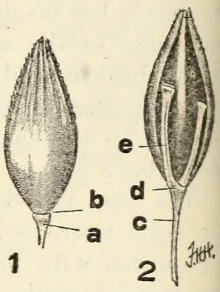

FIG. 5.—Stem-bearing seeds of Johnson grass, enlarged: (1) A seed in which the stem (*a*) is a portion of a rachis segment. The suture (*b*) at the junction of the stem and seed is evident. (2) A seed (the lowest of the cluster) in which the longer stem (*c*) is a part of the cluster branch. No suture occurs at the junction (*d*) of the branch and the first rachis segment (*e*). The opposite side of such a seed shows the suture, as at *b*.

APPARENT EXCEPTIONS TO THE DISTINGUISHING CHARACTERS DESCRIBED.

Conflicting conditions arise from exceptions in the manner of the fall of the seeds of Sudan grass and Johnson grass.

Occasional Sudan grass seeds have no stem at the base, but the scar usually is irregular or jagged, owing to the absence of a definite suture. Likewise, some seeds have one or both appendages unbroken, with expanded and occasionally cup-shaped apexes. The size of the seed, together with the size, form, and color of the grain, should suffice to distinguish the seed from that of Johnson grass.

Some of the seeds of Johnson grass present a short stem (fig. 5, *a*), owing to failure to separate at the articulation of the rachis and spikelet. In such cases, the distinct suture at the articulation in Johnson grass (fig. 5, *b*), evident under a good magnifier, appears to be an unfailing mark of distinction between the seeds of Johnson grass and Sudan grass. Corresponding with the occurrence of stem-bearing seeds, some of the former seeds show incomplete, broken appendages, similar to those which occur in the latter.

In the seeds of both Sudan grass and Johnson grass some individuals have a stem from one to three times as long as the seed (fig. 5, *c*). This is the portion of the branch immediately below the seed cluster, and the seed is the lowest one of the cluster. It will be observed in figure 5 and also in figure 2 that this branch is continued past the first spikelet without an evident suture (fig. 5, *d*). A partial suture for this first spikelet of the cluster does occur, however, at the base of the spikelet and is evident on the side of the axis opposite that shown in the figure, where it has the appearance shown in figure 5, *b*.

Examination of various samples of Sudan grass and Johnson grass seeds has shown the combined characters of size of seed in the hull, the presence or absence of the articulating suture, and finally the size, form, and color of the grain, including the relative size of the embryo (compare fig. 3, *e*, and fig. 4, *d*) to be conclusive points of distinction.

ADDITIONAL COPIES
OF THIS PUBLICATION MAY BE PROCURED FROM
THE SUPERINTENDENT OF DOCUMENTS
GOVERNMENT PRINTING OFFICE
WASHINGTON, D. C.
AT
5 CENTS PER COPY

▽

WASHINGTON : GOVERNMENT PRINTING OFFICE : 1916

NATIONAL AGRICULTURAL LIBRARY
1022789843